FIG.1

100

FIG.2

200

HALF-RATE PHASE DETECTOR — 210

DATA 1 — 215
DATA 2 — 217

DATA /2 — 135

REFERENCE — 224
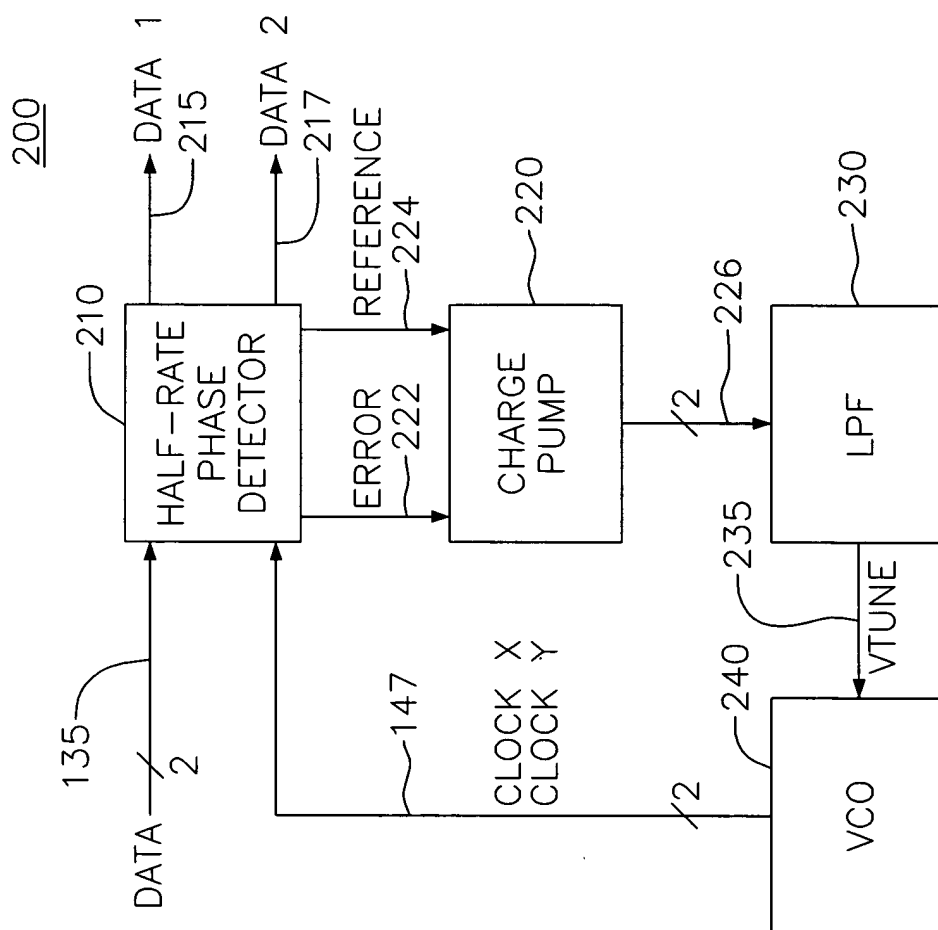ERROR — 222

CHARGE PUMP — 220

CLOCK X CLOCK Y — 147

/2 — 226

LPF — 230

VTUNE — 235

VCO — 240

/2

FIG.3

300

FIG. 4

FIG.5

FIG.6

600

FIG.7A 702

A	B	A⊕B	$\overline{A}$	$\overline{A}+B$	$\overline{B}$	$A+\overline{B}$	$\overline{(\overline{A}+B)+(A+\overline{B})}$
○	○	○	—	○	—	○	○
○	—	—	—	—	○	○	—
—	○	—	○	○	—	—	—
—	—	○	○	○	○	○	○

FIG.7B 700

FIG.8

800

FIG.9

FIG.10

FIG.11

FIG.12

FIG.13

1300

PROVIDE AN INPUT DATA SIGNAL, A CLOCK SIGNAL, AND A COMPLEMENTARY CLOCK SIGNAL. ——1310

APPLY THE INPUT DATA TO A FIRST LATCH CLOCKED BY THE CLOCK SIGNAL. ——1320

APPLY THE INPUT DATA TO A SECOND LATCH CLOCKED BY THE COMPLEMENTARY CLOCK SIGNAL. ——1330

APPLY THE OUTPUT OF THE FIRST LATCH TO A FIRST XOR GATE AND A THIRD LATCH. ——1340

APPLY THE OUTPUT OF THE SECOND LATCH TO THE FIRST XOR GATE AND A FOURTH LATCH. ——1350

APPLY THE OUTPUT OF THE THIRD LATCH AND THE FOURTH LATCH TO SECOND XOR GATE. ——1360

USE THE OUTPUT OF THE FIRST XOR GATE AS AN ERROR SIGNAL, THE OUTPUT OF THE SECOND XOR GATE AS A REFERENCE SIGNAL, THE OUTPUT OF THE THIRD LATCH AS A FIRST DATA OUTPUT, AND THE OUTPUT OF THE FOURTH LATCH AS A SECOND DATA OUTPUT. ——1370

SUBTRACT THE ERROR SIGNAL FROM 1/2 THE REFERENCE SIGNAL, AND FILTER. ——1380

USE FILTER OUTPUT TO ADJUST CLOCK AND COMPLIMENTARY CLOCK SIGNALS. ——1390